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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

MONDT, JOHANNES P

ART UNIT PAPER NUMBER

3663

DATE MAILED: 10/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/753,330

Applicant(s)

YOSHII ET AL.

Examiner

Johannes P. Mondt

Art Unit

3663

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 15 August 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 4,5 and 12-14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 4,5 and 12-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 1/9/04 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☒ Certified copies of the priority documents have been received in Application No. 09/895,213.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

### **DETAILED ACTION**

Amendment filed 8/15/05 forms the basis for this office action. In said Amendment Applicant cancelled claims 2, 3 and 6-11 (claim 1 had been cancelled previously) and substantially amended claims 4 and 5. Applicant added new claims 12-14. Comments on Remarks appended to said Amendment are included below under "Response to Arguments".

### ***Drawings***

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "collector electrode connected to the collector layer" (claim 4, see line 9, and claims dependent thereon) must be shown in conjunction with the limitation that the base layer has a band gap smaller than a band gap in each of the collector layer and the emitter layer (N.B.: of the elected Species' Drawings, Figures 2-7, only Figures 2, 4 and 7 show the device while only Figure 2 shows a collector electrode 208 in contact with a collector layer 206 through contact layer 207 (see [0084] in the Application) but the device of Figure 2 has GaN-layers for emitter 202, base 205 and collector 206 layers (see [0081] and therefore the claimed ordering in band gaps of the base with regard to emitter and collector does not apply; that there also is a separate active layer in Figure 2 is another matter) or the feature canceled from the claims. It is realized that a collector layer must be connected, at least electrically, with a collector electrode, and hence no new matter rejection is made. However, the claimed subject matter must be shown in a single Drawing with respect to all aspects claimed. No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. ***Claims 4-5 and 14*** are rejected under 35 U.S.C. 102(b) as being anticipated by Ogura (5,414,282) (made of record and cited previously).

*Ogura teaches* a semiconductor light-emitting device (cf. col. 5, l. 20-21 and col. 8, l. 27-34) comprising: a collector layer 16 and an emitter layer 12/13 respectively (cf. col. 10, l. 19-46), each of a first conductivity type (n-type) (loc.cit.); a base layer 14 (cf. col. 10, l. 30-34) of second conductivity type (p-type) provided between said collector and emitter layers, the base layer having a band gap (namely: the band gap of p-GaAs) that is smaller than a band gap in each of the collector and emitter layers, namely: a band gap for  $\text{Al}_x\text{Ga}_{1-x}\text{As}$  with  $x < 0.4$  as can be found in the emitter layer 12/13 (cf. col. 10, l. 52-55; because the base layer does not contain any Al), and a band gap of  $\text{Al}_{0.4}\text{Ga}_{0.6}\text{As}$  as can be found in the collector layer 16 (loc.cit.); a collector electrode 18 (col. 10, l. 64 – col. 11, l. 5) connected to the collector layer (furthermore, at least an electrical connection between any collector layer and an electrode inherently exists in any bipolar transistor); an emitter electrode connected to the emitter layer 20 (col. 11, l. 5-10); the base layer 14 emitting light with charge injected therein from the emitter layer (cf. col. 8, l. 27-38) and a base electrode 19 (col. 10, l. 64 - col. 11, l. 3), and the band gap in the collector layer 16 being larger than the band gap in the emitter layer 12/13 (because as shown by Vegard's Law the band gap of  $\text{Al}_{0.4}\text{Ga}_{0.6}\text{As}$  is larger than the band gap of  $\text{Al}_x\text{Ga}_{1-x}\text{As}$  for  $x < 0.4$ ).

In conclusion, *Ogura anticipates claim 4.*

*On claim 5:* an impurity concentration in the emitter layer 12/13 is higher at least in a region thereof opposite to the collector layer 16 than (the impurity concentration) in the collector layer 16 (cf. col. 10, l. 19-24 and col. 10, l. 39-43).

On claim 14: the first conductivity type is n-type and the second conductivity type is p-type (see above under claim 4 and see col. 10, l. 19-46).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. ***Claim 12*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogura (5,414,282) as applied above to claim 4, in view of Amamiya (6,037,616).

As detailed above, Ogura anticipate claim 4. Ogura does not necessarily teach the further limitation defined by claim 12.

However, it would have been obvious to include said further limitation in view of Amamiya, who, in a patent on an HBT, hence analogous art, teach gradual decrease of the band gap from emitter layer to collector layer through grading of the base layer and with a higher band gap in the emitter than in the collector (col. 3, l. 17-34) in order to gradually decrease the band gap from the emitter to the collector side so as to reduce carrier transit time and thereby increase the operation speed of the device (col. 3, l. 35-45). *Motivation* to include the teaching by Amamiya in the invention by Ogura in this regard immediately flows from the resulting increase in operational speed of the device (with loc.cit. to Amamiya). The teaching can be easily *combined* with the invention by selecting a lower band gap material for the collector than taught by Ogura and grading

the base layer so as to implement the gradual decrease of the band gap from emitter to collector within the base layer.

1. **Claim 13** is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogura (5,414,282) (made of record previously) in view of Ogura (5,667,552) (made of record previously). As detailed above, Ogura anticipates claim 4. Furthermore, nothing in the specification explains why the particular selection of n-type and p-type conductivities for first and second conductivity types as claimed elsewhere are critical to the invention. On the contrary, the joint inclusion of all physically sound selections through joint inclusion of original claims 6 and 7 (thus irreversibly belonging to the specification) indicates the opposite, namely: that said selections are not critical to the invention. Second, Ogura teaches as much by stating that pnp may also be used in his novel optoelectronic switch rather than npn bipolar transistors (cf. col. 10, l. 11-15). Third, Ogura, in a closely related patent including npn phototransistors, states that pnp phototransistors can similarly be used and similar operation may be achieved by reversing the connections of the emitters and collectors (cf. 5, l. 29-33). Therefore, it would have been obvious to enlarge the scope of the invention through inclusion of the teaching by Ogura (5,667,552) thus widening the design possibilities, said widening being in itself sufficient *motivation* to include said teaching by allowing freedom of design.

### ***Response to Arguments***

Applicant's arguments filed 8/15/05 with substantial amendments to the claims have been fully considered but they are not persuasive. In particular, considering the immediate contact between layers 12 and 13 and the same or similar doping

concentrations ( $10^{18} \text{ cm}^{-3}$ ) of layers 12 and 13 (col. 10, l. 19-30) any of said layers 12 and 13 and also their combination 12/13 meet, both to the letter and functionally, the limitation "collector layer". Therefore, the rejections made previously apply with only minor modifications to the substantially amended claim set, with the exception of newly added claim 12. However, as witnessed from Amamiya, HBTs with a collector layer with lower band gap than the emitter layer and with a base that is graded so as to have a band gap that is lower on the collector side than on the emitter side is obvious over the prior art as means to decrease the transit time of charge carriers across the thickness of the base (see rejection under 35 USC 103(a) of claim 12 above). Therefore, regrettably, the amended claims are not seen to contain any allowable subject matter.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of



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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P. Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack W. Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JPM  
October 18, 2005

  
JACK KEITH  
SUPERVISORY PATENT EXAMINER